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STATUS OF THE BREEDING POPULATION OF BLACK-TAILED GULLS ON HONGDO ISLAND, KOREA.

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Black-tailed Gulls (*Larus crassirostris*) are one of the most abundant seabirds in Korea, Japan, China, and Russia. There are about 11 records for Alaska and another 9 or so for the rest of North America, including sightings as far south as Belize and as far east as Newfoundland, Canada (Lethaby and Bangma 1998). The gulls breed colonially on islands or rocky cliffs, and forage for food (e.g. fish, bait and fishermen's garbage) near breeding areas (Paek and Yoo 1996).

In Korea, islands known as major breeding colonies of Black-tailed Gulls are Dokdo, Hongdo, Nando, Baengnyeongdo, Chilsando, and Chilbaldo (Figure 1). The islands are designated as a natural monument for conservation in Korea. One of the colonies, Hongdo Island, is the largest breeding colony. Therefore much research on Black-tailed Gulls is carried out there.

Hongdo Island (34° 31' 87" N, 128° 43' 88" E) is located about 50.5 km from the mainland (Tongyeong city, Gyeongsangnam-do, Republic of Korea). The highest point of the island is about 115 m above sea level, and its area is 98,380 m^2. Cliffs with a slope of over 45° surround the coastline. The vegetation consists mainly of a sedge (*Carex boottiana*), which covers the whole island except the rocky cliffs. Like other *Larus* gulls, Black-tailed Gulls use the sedge as the major nesting material (Lee 2004). The island is additionally covered with a mixture of plant species, of which *Camellia japonica*, *Opuntia ficus-indica*, *Aster spathulifolius*, and *Taraxacum mongolicum* are the main components (Cultural Properties Administration 2003).

Black-tailed Gulls arrive on Hongdo Island in early spring (February or March). Breeding is initiated in early April and finishes in late August. Clutch size is 2-3, and breeding success is about 50%, according to our previous research (Kwon 1998, Lee 2004). In contrast with other islands, only one species, Black-tailed Gulls, breeds on Hongdo Island (Kwon 1998). For this reason, one of the major causes of egg and chick mortality is pecking by neighboring adults, al-

FIGURE 1. Map of major colonies of Black-tailed Gulls in Korea, 1: Baengyeongdo Island; 2: Nando Island; 3: Chilsando Island; 4: Chilabaldo Island; 5: Hongdo Island; 6: Dokdo Island.

TABLE 1. Nearest distance between neighbors and clutch size of Black-tailed Gulls on Hongdo Island, Korea in 1997, 2000, and 2003. Data are mean ± SE (n).

Year	Nearest distance between neighbors	Clutch size	Source
1997	114.35 ± 53.90 (39)	1.90 ± 0.46 (83)	Kwon (1998)
2002	88.92 ± 19.02 (130)	1.87 ± 0.55 (130)	This study
2003	87.35 ± 15.03 (128)	1.97 ± 0.59 (128)	This study

though one pair of Peregrine Falcons (*Falco peregrinus*) breeds at the same time (Lee 2004).

Breeding populations of Black-tailed Gulls on Hongdo Island have not been censused recently, but numbers of Black-tailed Gulls have apparently increased from about 10,000 pairs in 1995 (Peak and Yoo 1996). However, little is known about breeding ecology except for the initial state of the breeding (Yoo and Kwon 1997), breeding strategy (Kwon 2004), and habitat selection (Lee 2004). In this study, in order to analyze the status of breeding population, we compared the nearest distance between neighbors (i.e. density) in 2002-03 with data from 1997.

Our field work was carried out during the breeding seasons of 2002 and 2003. We selected 130 nest sites in 2002 and 128 in 2003, and checked breeding performance (e.g. clutch size, laying data, egg mass, hatching date, and chick size). After termination of laying, the nearest distance between neighbors was measured as the distance from the center of one nest to the center of the nearest nest. If the nest was not clearly evident, we measured the distance from stake to stake.

The nearest distance between neighbors on Black-tailed Gulls on Hongdo Island was shorter in 2002-2003 than in 1997 (1997: 114.35 ± 53.90; 2002: 88.92 ± 19.02; 2003: 87.35 ± 15.03). However, clutch size was not different among years (1997: 1.90 ± 0.46; 2002: 1.87 ± 0.55; 2003: 1.97 ± 0.59) (Table 1). Although we did not census the breeding population of Black-tailed Gulls on Hongdo Island, our results suggest that density of the gulls was higher in 2002 and 2003 than in 1997.

In a breeding population, the probability of egg and chick mortality and the intensity of competition for nest sites and food are likely to increase when population density increases. A decline in density may be observed when the breeding population is saturated. In such a case, individuals of good quality probably would coexist with poor-quality individuals. Lack (1968) suggested that clutch size was correlated with parental quality. However, we did not see this indication of variation in parental quality among years, even though density had increased. Therefore we suggest that density of the population may have increased since 1997, but without reaching saturation. We do not have complete evidence for this theory.

For preservation of a species, conservation of the breeding area is very important (Furness and Monaghan 1987). Access is not allowed to Hongdo Island at present, in order to protect the breeding Black-tailed Gulls. The government has not made a plan for conservation of the species, except for limiting public access. Although Black-tailed Gulls are very common in Korea and the population is increasing on Hongdo Island, which is the largest colony in Korea, the establishment of a conservation plan is very important. In addition, long-term monitoring of the breeding population of Black-tailed Gulls is necessary for preservation.

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